ആഗസ്റ്റ് 2024

Atal Mission for Rejuvenation and Urban Transformation

# അമൃത്
## വാർത്താ പത്രിക

ലക്കം 6

അമൃത് മിഷൻ ഡയറക്ടറായി ശ്രീ. സൂരജ് ഷാജി ഐ.എ.എസ്സ് ചുമതലയേറ്റു. നിലവിൽ നഗരകാര്യ ഡയറക്ടറായും ലൈഫ് മിഷന്റെ ചീഫ് എക്സിക്യൂട്ടീവ് ഓഫീസറായും പ്രവർത്തിച്ചുവരുന്നു.

അമൃത് പദ്ധതി വിലയിരുത്തുന്നതിനായി കേന്ദ്ര സംഘം കൊല്ലം  കോർപ്പറേഷൻ സന്ദർശിച്ചു

# അമൃത് വാർത്താ പത്രിക

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## എഡിറ്റോറിയൽ

നമ്മുടെ സംസ്ഥാനം കഴിഞ്ഞ നാളുകളിൽ സമാനതകളില്ലാത്ത ഒരു പ്രകൃതി ദുരന്തത്തിലൂടെയാണ് കടന്നുപോയത്. പ്രകൃതി മനോഹരമായ വയനാട്ടിലെ മുണ്ടക്കൈ, ചൂരൽമല എന്നീ പ്രദേശങ്ങളെ പ്രകൃതി തന്നെ ദുരന്തമുഖമാക്കിയ വാർത്ത വളരെ നടുക്കത്തോടെയാണ് നാം കേട്ടത്. രാത്രി സമാധാനമായി നാളെയുടെ പ്രതീക്ഷകളും സ്വപ്നങ്ങളും കണ്ടുറങ്ങിയവരെ ഉരുൾപ്പൊട്ടൽ നിമിഷം നേരം കൊണ്ട് ഒന്നുമല്ലാതാക്കി. കൂടെ കിടന്നുറങ്ങിയ പ്രിയപ്പെട്ടവർ നഷ്ടപ്പെട്ടവരുടെ ദൈന്യമുഖങ്ങൾ എത്ര നാൾ കഴിഞ്ഞാലാണ് നമുക്ക് വിസ്മരിക്കാൻ സാധിക്കുക. അവരുടെ ദു:ഖത്തിൽ നമുക്കും പങ്കുചേരാം. സംസ്ഥാന സർക്കാർ നടത്തുന്ന ദുരിതാശ്വാസ പ്രവർത്തനങ്ങളിൽ ഭാഗഭാക്കായി നമ്മുടെ സഹോദരങ്ങളുടെ കണ്ണീരൊപ്പുവാൻ ഒരു കൈത്താങ്ങായി മാറാൻ നമുക്കും സാധിക്കട്ടെ.

അമൃത് 1.0 പദ്ധതി പ്രവർത്തനങ്ങൾ ഭൂരിഭാഗവും നാം പൂർത്തീകരിച്ചു കഴിഞ്ഞു. സെപ്റ്റേജ്/സ്വീവേജ് മേഖലയിലെ ചില പദ്ധതികൾ മാത്രമാണ് പൂർത്തീകരിക്കാനുള്ളത്. അത് പൂർത്തീകരിക്കുന്നതിനും പദ്ധതി പ്രവർത്തനം പൂർണ്ണമാക്കുന്നതിനുമായി കേന്ദ്ര ഭവന നഗരകാര്യ വകുപ്പ് പദ്ധതി കാലയളവ് 31.12.2024 വരെ ദീർഘിപ്പിച്ചിട്ടുണ്ട്. 9 അമൃത് നഗരങ്ങളിൽ ശേഷിക്കുന്ന പദ്ധതികൾ വളരെ വേഗം പൂർത്തീകരിക്കുവാൻ അതാത് നഗരസഭകൾ ശ്രദ്ധിക്കണമെന്ന് ഓർമപ്പെടുത്തുന്നു.

അമൃത് 2.0 പദ്ധതി പ്രവർത്തനങ്ങൾ കുറച്ചുകൂടി കാര്യക്ഷമമായി മുന്നോട്ട് കൊണ്ടുപോകേണ്ടതുണ്ട്. പദ്ധതിയ്ക്കായുള്ള കേന്ദ്ര സഹായം ലഭ്യമാകുന്നത് വിവിധ ഘട്ടങ്ങളായി നടക്കുന്ന പദ്ധതി പ്രവർത്തനങ്ങൾ വിലയിരുത്തിയാണ്. അതുകൊണ്ട് തന്നെ പൂർണ്ണമായ തോതിൽ കേന്ദ്ര വിഹിതം ലഭിക്കണമെങ്കിൽ പദ്ധതി പ്രവർത്തനങ്ങളിലെ ഭൗതീക പുരോഗതി നാം കൈവരിക്കേണ്ടിയിരിക്കുന്നു. ഇക്കാര്യത്തിൽ തദ്ദേശ നഗര സ്ഥാപനങ്ങൾ പദ്ധതി പ്രവർത്തനങ്ങളിൽ പ്രത്യേക ശ്രദ്ധ ചെലുത്തേണ്ടതാണ്. പദ്ധതി പ്രവർത്തനങ്ങളിലെ കാര്യക്ഷമതയും സുതാര്യതയും ഉറപ്പ് വരുത്തി വളരെ വേഗത്തിൽ പദ്ധതി പ്രവർത്തനങ്ങൾ പൂർത്തീകരിക്കാൻ നമുക്ക് ശ്രമിക്കാം.

സ്വാതന്ത്ര്യത്തിന്റെ 78-ാം വാർഷികം ആഘോഷിക്കുന്ന ഈ വേളയിൽ ഏവർക്കും സ്വാതന്ത്ര്യ ദിനാശംസകൾ നേരുന്നു.

മിഷൻ ഡയറക്ടർ


തദ്ദേശസ്വയംഭരണ വകുപ്പ്
കേരള സർക്കാർ

ചീഫ് എഡിറ്റർ
സൂരജ് ഷാജി ഐ.എ.എസ്
മിഷൻ ഡയറക്ടർ

എഡിറ്റർ
ലുഖ്മാൻ എം.
ഡെപ്യൂട്ടി മിഷൻ ഡയറക്ടർ

അസിസ്റ്റന്റ് എഡിറ്റർ
സാവിയോ സജി ഇ.ആർ.



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*(സ്വകാര്യ വിതരണത്തിന് മാത്രം)*

തൃശ്ശൂർ കോർപ്പറേഷൻ അമൃത് പദ്ധതി പ്രവർത്തനങ്ങൾ മിഷൻ ഡയറക്ടർ
എം.ജി. രാജമാണിക്യം ഐ.എ.എസ്സ്. വിലയിരുത്തുന്നു

അമൃത് വാർത്താ പത്രിക

ആഗസ്റ്റ് 2024

# ഉള്ളടക്കം

തൃപ്പൂണിത്തുറ മുനിസിപ്പാലിറ്റി
താമണ്ടി കുളം



അമൃത് 2.0 പദ്ധതിയിൽ ഉൾപ്പെടുത്തി നവീകരണ പ്രവൃത്തികൾ പുരോഗമിക്കുന്ന തൃശ്ശൂർ കോർപ്പറേഷനിലെ അമ്പാടിക്കുളം


തൃശ്ശൂർ കോർപ്പറേഷൻ അമൃത് പദ്ധതി പ്രവർത്തനങ്ങൾ മിഷൻ ഡയറക്ടർ
എം.ജി. രാജമാണിക്യം ഐ.എ.എസ്സ്. വിലയിരുത്തുന്നു

# പെരിന്തൽമണ്ണ മുനിസിപ്പാലിറ്റിയിലെ 12 കുളങ്ങൾ നവീകരിച്ചു

അമൃത് 2.0 പദ്ധതിയിലുൾപ്പെടുത്തി പെരിന്തൽമണ്ണ നഗരസഭയിൽ പുനരുദ്ധാരണം നടത്തിയ 12 കുളങ്ങളുടെ ഉദ്ഘാടനം മിഷൻ ഡയറക്ടർ, എം.ജി. രാജമാണിക്യം നിർവ്വഹിച്ചു. പെരിന്തൽമണ്ണ നഗരസഭയുടെ വിവിധ പ്രദേശങ്ങളിൽ സ്ഥിതി ചെയ്യുന്നതും മികച്ച ജലാശയങ്ങളും പരമ്പരാഗത ജലസ്രോതസ്സുകളുമായ 12 കുളങ്ങളുടെ പുനരുദ്ധാരണ പ്രവൃത്തികളാണ് അമൃത് പദ്ധതിയിൽ ഉൾപ്പെടുത്തി നടപ്പിലാക്കിയത്. വളരെ നാളുകളായി ശോചനീയാവസ്ഥയിൽ ഉപയോഗ ശൂന്യമായി കിടന്നിരുന്ന ജലാശയങ്ങളെ പുനരുദ്ധാരണത്തിലൂടെ നാടിന് ഉപയോഗപ്രദമാക്കുവാൻ സാധിച്ചു. ജലം സംഭരിക്കുന്നതിനും, ജലസേചനത്തിനും, കുളിക്കുന്നതിനും മറ്റാവശ്യങ്ങൾക്കും ഉതകുന്ന രീതിയിലാണ് ഈ കുളങ്ങൾ നവീകരിച്ചിരിക്കുന്നത്.

പുത്തൻ കുളം (വാർഡ് 5), പൊന്ന്യാകുർശ്ശി കുളം (വാർഡ് 6), പാറക്കോട് കുളം (വാർഡ് 13), കോരക്കുളം (വാർഡ് 14), നെല്ലിപ്പാടം കുളം (വാർഡ് 20), നാരിയേങ്ങൽ കുളം (വാർഡ് 25), മേലേച്ചോലക്കുളം (വാർഡ് 13), ചാലിയം കുളം (വാർഡ് 7), ഏങ്ങണപ്പാറ കുളം (വാർഡ് 34), ആശാരിക്കുളം (വാർഡ് 25), ചെറുകുളം (വാർഡ് 15), ആനക്കുണ്ട് മുണ്ടത്തപ്പാലം കുളം (വാർഡ് 4) എന്നീ കുളങ്ങളാണ് നവീകരിച്ചത്. കുളങ്ങളുടെ പാർശ്വ ഭിത്തി കെട്ടി, മാലിന്യങ്ങൾ നീക്കം ചെയ്ത് ജനങ്ങൾക്ക് കൃഷിക്കും മറ്റാവശ്യങ്ങൾക്കും പ്രയോജനകരമാകുന്ന രീതിയിലാണ് കുളങ്ങൾ നവീകരിച്ചിരിക്കുന്നത്.

ഉദ്ഘാടന സമ്മേളനത്തിൽ പെരിന്തൽമണ്ണ നഗരസഭ ചെയർമാൻ പി. ഷാജി അദ്ധ്യക്ഷനായിരുന്നു. വൈസ് ചെയർപേഴ്സൺ എ. നസീറ ടീച്ചർ, സ്റ്റാൻഡിംഗ് കമ്മിറ്റി ചെയർമാൻമാരായ മുണ്ടുമ്മൽ മുഹമ്മദ് ഹനീഫ, കെ. ഉണ്ണികൃഷ്ണൻ, അമ്പിളി മനോജ്, അഡ്വ. ഷാൻസി, മൻസൂർ നെച്ചിയിൽ, നഗരസഭാ സെക്രട്ടറി മിത്രൻ ജി., നഗരസഭാ എഞ്ചിനീയർ നിഷാന്ത് കെ. എന്നിവർ ചടങ്ങിൽ സന്നിഹിതരായിരുന്നു.


*Congratulations to Our Experts on their remarkable achievement!*

**Sri. Vijayakumar M.K.**

**Smt. Ashida. A.G.**

**Sri. Ramu Vinayak S.**

We are delighted to extend our heartfelt congratulations to Smt. Ashida. A.G , Sri. Ramu Vinayak S., and Sri. Vijayakumar M.K. on their exceptional achievement of completing the M.Tech in Environmental Engineering from KTU with distinction. Their success in this challenging program is a testament to their dedication, hard work, and expertise. Having pursued their studies at CET, one of India's premier institutions and the leading institution in Kerala, their accomplishment reflects both their commitment to excellence and their deep passion for the field of environmental engineering.


# നവീകരിച്ച മന്നിക്കര കുളത്തിന്റെയും ഓപ്പൺ ജിമ്മിന്റെയും ഉദ്ഘാടനം നടത്തി

അമൃത് ഒന്നാം ഘട്ട പദ്ധതിയിൽ ഉൾപ്പെടുത്തി പൂർത്തീകരിച്ച ഗുരുവായൂർ തൈയ്ക്കാട് മന്നിക്കരയിൽ ഇ.കെ. നായനാർ പാർക്കിനോട് അനുബന്ധിച്ച് നവീകരിച്ച മന്നിക്കര കുളത്തിന്റെയും വ്യായാമത്തിനായി നിർമ്മിച്ച ഓപ്പൺ ജിമ്മിന്റെയും ചിൽഡ്രൻസ് പാർക്കിന്റെയും ഉദ്ഘാടനം മണലൂർ എം.എൽ.എ. മുരളി പെരുനെല്ലി നിർവ്വഹിച്ചു. നഗരസഭാ ചെയർമാൻ എം. കൃഷ്ണദാസ് അദ്ധ്യക്ഷത വഹിച്ചു.

നിലവിലെ മതിൽ പുനർനിർമാണം നടത്തി ഭംഗിയാക്കി. പുതിയ ഗേറ്റുകൾ സ്ഥാപിച്ചു. നടപ്പാതയും പാർക്കിംഗ് സ്ഥലവും ഇന്റർലോക് ചെയ്തു. സന്ദർശകർക്ക് ഇരിക്കുന്നതിനായി സിമന്റ് ബഞ്ചുകൾ സ്ഥാപിച്ചു. കൂടാതെ ഗ്രീൻ റൂമുകളും ടോയ്‌ലെറ്റ് അടക്കമുള്ള ഒരു സ്റ്റേജ് ബ്ലോക്കും, ടോയ്‌ലെറ്റുകൾ മാത്രമുള്ള ഒരു ബ്ലോക്കും സ്ഥാപിച്ചു. പുല്ലു വിരിച്ച് ടർഫിംഗ് നടത്തി പൂച്ചെടികളും മരങ്ങളും വെച്ചുപിടിപ്പിച്ചാണ് ഓപ്പൺ സ്പേസ് നിർമിച്ചിട്ടുള്ളത്. കുട്ടികൾക്ക് കളിക്കുന്നതിനും വ്യായാമം ചെയ്യുന്നതിനുമായി ചെറുതും വലുതുമായ 11 ഇനം കളിയുപകരണങ്ങൾ പാർക്കിൽ സ്ഥാപിച്ചിട്ടുണ്ട്.

പാർക്കിലേയ്ക്ക് റോഡിൽ നിന്നും 60 മീറ്റർ ദൂരമുണ്ട്. ഇവിടേയ്ക്കുള്ള ഇടുങ്ങിയ വഴി വീതി കൂട്ടുന്നതിനായി സമീപത്തെ സ്ഥല ഉടമകൾ സൗജന്യമായി ഭൂമി വിട്ടുനൽകി. വഴിയ്ക്ക് ഇരുവശവും കരിങ്കൽ കെട്ടി ഇന്റർലോക്ക് ചെയ്യുന്നതിന് നഗരസഭാ ഫണ്ടിൽ നിന്ന് 9 ലക്ഷം രൂപ കൂടി ചെലവഴിച്ചു.

# SEWAGE TREATMENT TECHNOLOGIES

**1. INTRODUCTION**

Various technologies are available for optimal planning of Sewage Treatment projects. A clear understanding of the various technology options is a must. In Urban Local Bodies (ULBs), there is often a lack of Environmental Engineers, who are essential to design the best technology suitable for capacity, space availability, and desired effluent standards. In this regard, various technological options are illustrated with comparative merits and demerits. The purpose of this advisory is to assist State/ULB officials in selecting appropriate technologies that align with their requirements, available resources, and specific site conditions. This advisory has been prepared by considering the current capacities of State/ULBs officials and the implementation time frame of the Mission.

**2. TYPES OF SECONDARY BIOLOGICAL TREATMENT PROCESS**

State / ULB is free to adopt any proven technology, as brought out in the CPHEEO Manual / MoHUA Advisories from time to time. State Governments are encouraged to select nature-based sewage treatment technologies (alone or in a combination of two to attain desired treated effluent quality), where feasible, to economise Capex & Opex. However, for smaller ULBs, suitable combinations of nature-based technologies may be adopted.

a. Aerobic Treatment Process
- Activated Sludge Process (ASP)
- Sequencing Batch Reactor (SBR)
- Moving Bed Bio Reactor (MBBR)/ Fluidized Aerobic Bioreactor (FAB)
- Membrane Bio Reactor (MBR)
- BIOFOR – Biological Filtration and Oxygenated Reactor
- High Rate Activated Sludge BIOFOR – F Technology
- Submerged Aeration Fixed Film (SAFF) Technology
- Fixed Bed Biofilm Activated Sludge Process (FBAS)
- Fixed Media like Rotating Biological Contractor (RBC)
- Oxidation Ditch (OD)

b. Anaerobic Treatment Systems
- Up flow Anaerobic Sludge Blanket – UASB
- Anaerobic Filter – AF
- Anaerobic Fluidized Bed

c. Facultative Treatment Processes
- Aerated Lagoon – AL
- Waste Stabilization Pond – WSP
- Eco Bio Block – EBB


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## I. Activated Sludge Process

The conventional activated sludge process begins with sewage and returns activated sludge (RAS) entering an aeration tank, where they mix to form a suspension known as mixed liquor. In this tank, microorganisms in the activated sludge metabolize organic pollutants from the sewage in the presence of oxygen supplied through aeration. After treatment, the mixed liquor flows into a clarifier where settling occurs: heavier activated sludge settles at the bottom while clarified effluent rises to the top. The effluent is discharged over clarifier weirs, with a portion of settled activated sludge recycled back to the aeration tank as return activated sludge (RAS) to maintain a viable microbial population. Another portion of the settled sludge is continuously removed as waste-activated sludge (WAS) to prevent excessive biomass buildup. This process ensures the effective removal of organic contaminants from sewage, producing treated effluent suitable for discharge or further treatment while managing biomass for optimal treatment efficiency.

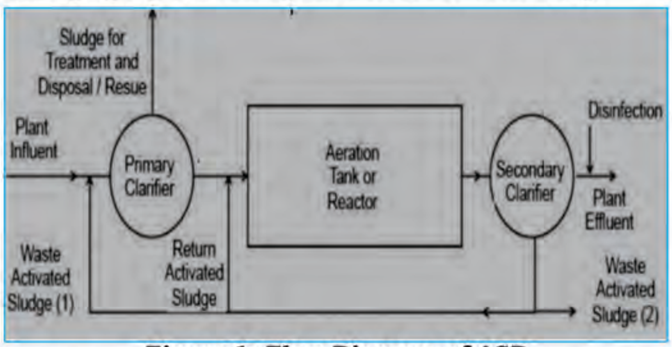
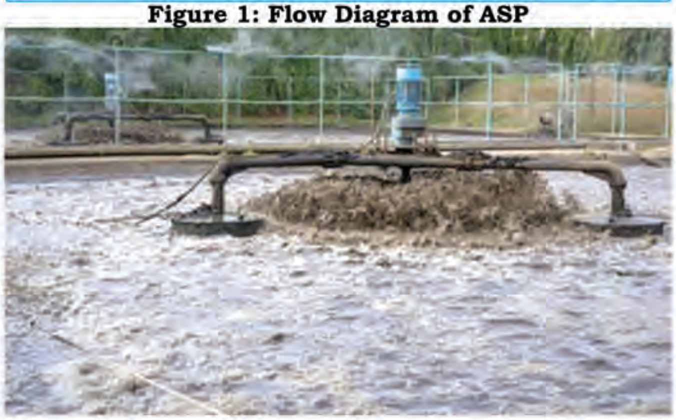



**Figure 1: Flow Diagram of ASP**



## II. Sequencing Batch Reactor (SBR)

The sequencing batch reactor (SBR) is a highly effective and versatile wastewater treatment system integrating equalization, aeration, and clarification processes within a single reactor vessel. During operation, the SBR cycles through distinct phases: fill, aeration, settling, and draw/decant. In the fill phase, wastewater enters the reactor, allowing for initial mixing and equalization of influent flows. Aeration follows, where oxygen is introduced to support aerobic microbial activity, facilitating the breakdown of organic pollutants. Subsequently, the settling phase allows suspended solids and biomass to settle, while clarified effluent rises to the surface. The final draw/decant phase involves removal of treated effluent for discharge or further treatment, leaving behind a portion of treated biomass (sludge) in the reactor. This cyclic operation ensures efficient wastewater treatment, making the SBR system suitable for a wide range of applications, from municipal sewage treatment to industrial wastewater management.

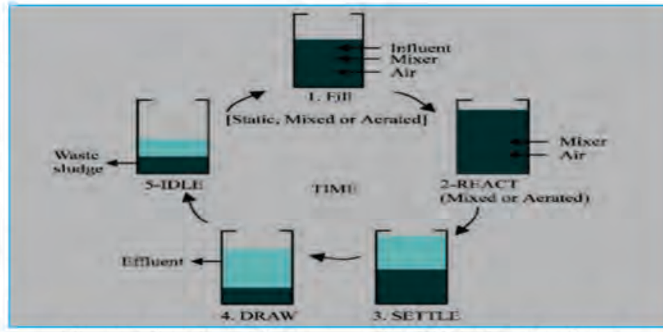
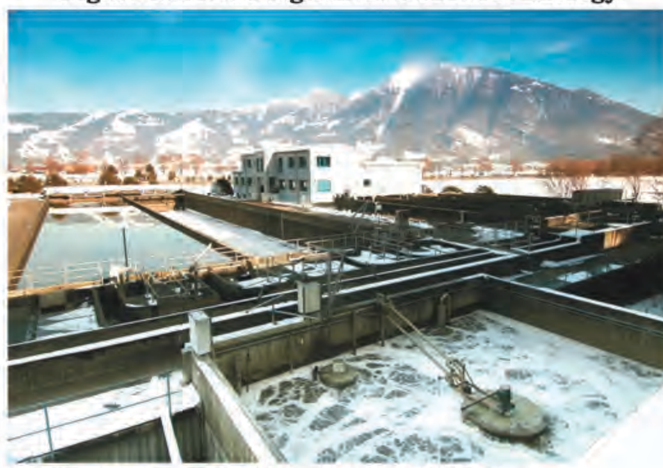



**Figure 2: Flow Diagram of a SBR Technology**



## III. Moving Bed Biofilm Reactor (MBBR)

Plastic carriers in the aeration tank of wastewater treatment plants serve a critical role by providing a large surface area for microbial attachment and growth. This innovative approach combines the advantages of both activated sludge systems and traditional fixed film processes. Wastewater continuously flows through the system, allowing microorganisms to form biofilms on the carriers. This biofilm is essential as it facilitates effective treatment by promoting sufficient contact between the wastewater and the microorganisms, which metabolize organic pollutants under aerobic conditions. The process air supply ensures vigorous mixing, enhancing oxygen transfer and maximizing treatment efficiency. By utilizing plastic carriers, wastewater treatment plants optimize biological processes, ensuring robust removal of contaminants and contributing to the overall effectiveness of wastewater treatment operations. Factors to consider while selecting MBBR media are Surface Area, Voidage, Media shape & size, biological activity & kinetics, Durability, Chemical inertness, Density and Operational considerations

## IV. Membrane Bioreactor (MBR)

Membrane bioreactor (MBR) technology combines biological-activated sludge processes with advanced membrane filtration, representing a highly efficient approach to wastewater treatment. One of its key advantages is its significantly reduced footprint compared to traditional treatment methods, making it particularly suitable for applications where space is limited. MBR systems operate with exceptionally high Mixed Liquor Suspended Solids (MLSS) concentrations, typically ranging from 8000 to 20000 mg/l, thanks to the effective separation capabilities of the membranes. This enables MBRs to handle fluctuations in wastewater loadings and effectively treat high-strength wastewater. Despite generally higher operational and maintenance costs—approximately 20% more than conventional activated sludge processes (ASP)—MBRs offer superior effluent quality and reliability. Various membrane types are employed in MBRs, including microfiltration, ultrafiltration, nanofiltration, and reverse osmosis, each tailored to specific treatment needs and contributing to the system's overall flexibility and efficiency in treating diverse wastewater streams.

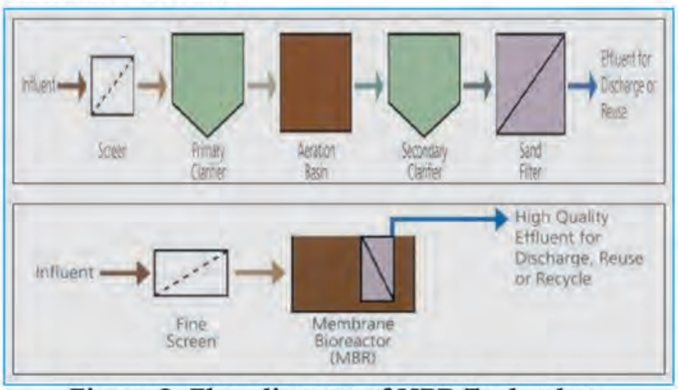



**Figure 3: Flow diagram of MBR Technology**

## V. Extended Aeration System:

Extended Aeration System is a completely mixed, suspended growth type of biological process in which wastewater will be aerated in a reactor with a detention time of 12 - 24 hours. As the name suggests, the waste will be subjected to aeration for an extended period than required for aerobic decomposition of wastewater. This process does not require primary settling. As the substrate-to-microorganism ratio is kept very low, the mixed liquor-suspended solids present in the reactor undergo considerable endogenous respiration and get well stabilized. Hence, the sludge produced will be less in quantity and it does not require any further digestion. As the BOD removal efficiency is 95-98% no post treatment is required

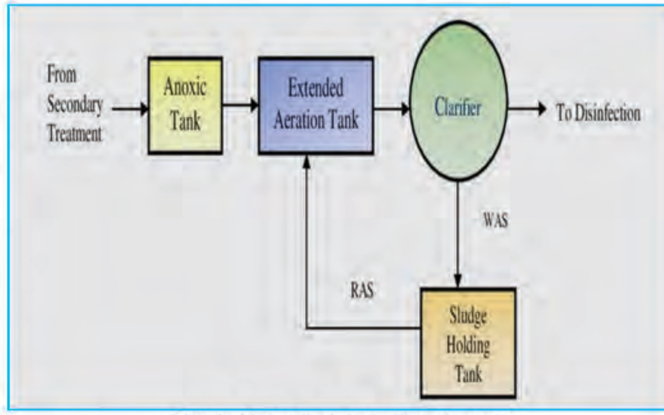



**Fig 4: Extended Aeration System**

## VI. Up-flow Anaerobic Sludge Blanket Process:

Up-flow Anaerobic Sludge Blanket Process is a fully anaerobic wastewater treatment system in which wastewater will be uniformly distributed at the bottom of the reactor which flows in upward direction passing through a dense sludge blanket. The anaerobic microorganisms present in the sludge blanket remove BOD from the passing liquid. The treated wastewater will be collected through effluent channels at the top. The upflow velocity in the reactor is maintained such that no carry over of solids is permitted. The hydraulic retention time in the reactor will be about 6 - 12 hours. The biogas generated will be taken out through a hood at the top of the reactor. This process also does not require any primary settling. Since the overall efficiency is about 50-70%, it is not possible to get desired effluent quality for discharging directly in to water body or land. Hence post treatment of the effluent from the UASB is required.

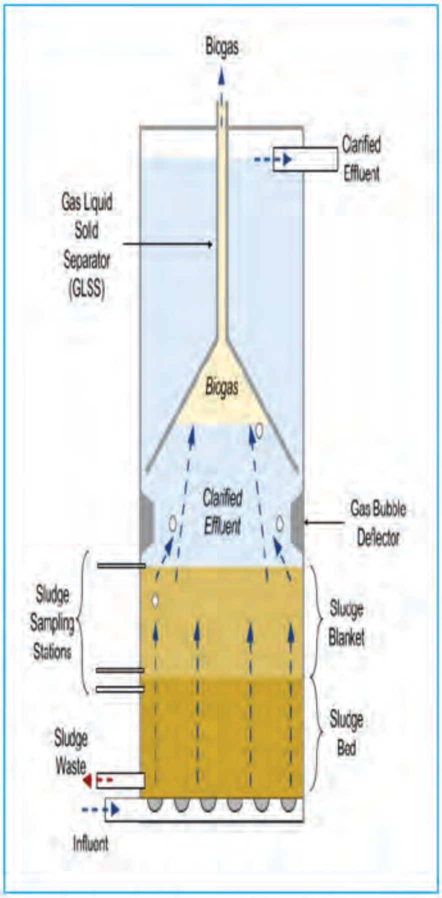
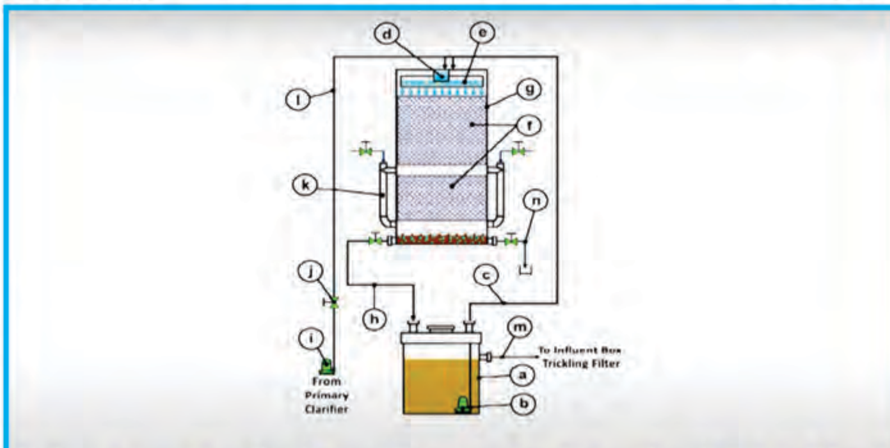



**Fig 5: Up Flow Anaerobic Sludge Blanket Process**

### VII. Bio-Towers: 49/95

Bio-Towers are non-submerged fixed film reactors in which wastewater will be allowed to flow through the voids of a filter media. The film of microorganisms formed on the surface of the media removes BOD in the passing liquid. As the influent is distributed uniformly at the top of the reactor, it gets simultaneously exposed to ambient air. Air also gets supplied because of the natural draft due to temperature gradient. The fill media used is lightweight plastic media with high surface area and voidage. When the influent contains high concentration of suspended solids, Bio-Tower is preceded by primary sedimentation. These are always followed by secondary settling tanks for removing settlable organic solids from the treated effluent and sloughed biofilm from the reactor. Since the overall efficiency is about 75 to 90%, it is not possible to get desired effluent quality for discharging directly in to water body or land. Hence Bio-Towers are used in stages with first stage being a low rate one and the second stage being a high rate one.




Bio-Tower System: a) Reservoir, b) Pump, c) Recirculating Pipe, d) Influent Pan, e) Distributor f) Growth Media, g) Bio-tower vessel, h)Return pipe, i) Feed pump, J) Flow valve, k) Air disrtibuter, l) Feed pipe, m) Discharge pipe, n) Drain port

**Fig 6: Bio-Tower (Source -Doelle et al., 2020)**

**Table No. 1 Merits and Demerits of various Technologies**

| Criteria | Activated Sludge Process (ASP) | Sequencing Batch Reactor (SBR) | Moving Bed Biofilm Reactor (MBBR) | Membrane Bioreactor (MBR) | Extended Aeration System | Up-flow Anaerobic Sludge Blanket (UASB) | Bio-Towers |
|---|---|---|---|---|---|---|---|
| Treatment Efficiency | High | High | High | Very High | Very High | Moderate (50 -70%) | High |
| Flexibility | High | High | Moderate | Moderate | Low | Low | Low |
| Cost Efficiency | Cost-effective | Potential capital cost savings | Cost-effective | Generally higher | Moderate | Low | Moderate |
| Energy Consumption | High | Moderate | Low | High | Very High | Low | Low |
| Land Requirement | Moderate | Minimal | Small | Compact | Low | Very Low | Low |
| Operational Complexity | Complex | Higher sophistication | Moderate | High | Simple | Complicated | Moderate |
| Maintenance Needs | High | High | Moderate | High | High | Complicated | High |
| Sludge Management | Complex, requires handling | Simple, but some sludge may discharge | Moderate, reduced sludge | Minimal (well stabilized) | High | Requires post-treatment | Moderate |
| Sensitivity to Industrial Wastes | Sensitive | Moderate | Less sensitive | Less sensitive | Less sensitive | Moderate | Less sensitive |
| Skilled Operation Required | Yes | Yes | Yes | Yes | Less | Yes | Moderate |
| Post-Treatment Required | No | No | No | No | No | Yes | Yes |
| Fly and Odour Issues | None | None | None | None | None | None | Fly nuisance - yes |

**VIII. Nature-based wastewater treatment systems**

These are also known as natural or ecological treatment systems, use natural processes to treat wastewater, offering an eco-friendly alternative to conventional methods. Examples include constructed wetlands, reed beds, and biofiltration systems. Constructed wetlands simulate natural wetlands with aquatic plants that filter pollutants through various natural processes, while reed beds use common reed plants to effectively remove organic matter, nitrogen, and phosphorus through filtration and microbial action. Biofiltration systems utilize porous media and microorganisms to degrade pollutants. These systems are environmentally sustainable, requiring less energy and chemicals, and reducing waste production. They are cost-effective due to lower capital and operational expenses and can be scaled and adapted for different needs. By integrating these systems, we can enhance wastewater treatment efficiency, promote ecological resilience, and contribute to water conservation and ecosystem protection.

## 3. COMPARATIVE ANALYSIS OF BIOLOGICAL WASTEWATER TREATMENT TECHNOLOGIES

The choice of the best treatment process will depend on specific project requirements, including budget, space constraints, wastewater characteristics, and operational preferences.

**1. For High Efficiency and Compact Layout**: **Membrane Bioreactor (MBR)** is best due to its high treatment efficiency and compact layout, though it comes with higher costs and energy requirements.

**2. For Cost Efficiency and Simple Operation**: **Extended Aeration System** offers high efficiency and simple operation without the need for post-treatment, but it has very high power requirements and operational costs.

**3. For Flexibility and Small Footprint**: **Sequencing Batch Reactor (SBR)** provides flexibility and has a minimal footprint, with the advantage of integrating several treatment stages in one vessel.

**4. For Low Land and Energy Requirements**: **Up-flow Anaerobic Sludge Blanket (UASB)** has very low land and power requirements, though it requires post-treatment and has moderate efficiency.

**5. For Low Maintenance and Shock Load Resistance**: **Moving Bed Biofilm Reactor (MBBR)** is easy to operate and resistant to shock loads, making it a good choice for stable operations with lower maintenance needs.

**6. For Systems that Handle High Suspended Solids**: **Bio-Towers** can be effective in managing high suspended solids with stable operation, though they require primary and secondary settling and have moderate operational problems.

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# അമൃത് 2.0 പദ്ധതി പുരോഗതി (31.07.2024 പ്രകാരം)

(തുക കോടിയിൽ)

| ജില്ല | ആകെ പദ്ധതികൾ | ഭരണാനുമതി ലഭിച്ച പദ്ധതികൾ | ഭരണാനുമതി തുക | സാങ്കേതിക അനുമതി ലഭിച്ച പദ്ധതികൾ | സാങ്കേതികാനുമതി തുക | ടെന്റർ ലഭിച്ച പദ്ധതികൾ | ടെന്റർ തുക | അവാർഡ് ചെയ്ത പദ്ധതികൾ | പൂർത്തീകരിച്ച പദ്ധതികൾ | ചെലവഴിച്ച തുക |
|---|---|---|---|---|---|---|---|---|---|---|
| ആലപ്പുഴ | 31 | 29 | 66.75 | 27 | 67.50 | 27 | 54.39 | 21 | 0 | 9.94 |
| എറണാകുളം | 63 | 57 | 391.76 | 55 | 376.89 | 52 | 287.71 | 34 | 1 | 24.17 |
| ഇടുക്കി | 5 | 5 | 2535 | 5 | 24.18 | 5 | 23.59 | 3 | 0 | 6.01 |
| കണ്ണൂർ | 33 | 28 | 150.33 | 22 | 133.07 | 22 | 123.07 | 16 | 2 | 33.04 |
| കാസറഗോഡ് | 15 | 8 | 13.11 | 6 | 12.89 | 6 | 9.97 | 6 | 3 | 3.93 |
| കൊല്ലം | 51 | 44 | 274.31 | 42 | 236.99 | 42 | 184.18 | 37 | 5 | 11.67 |
| കോട്ടയം | 23 | 21 | 80.83 | 21 | 75.04 | 21 | 71.77 | 17 | 0 | 23.36 |
| കോഴിക്കോട് | 34 | 34 | 388.05 | 31 | 117.07 | 31 | 81.30 | 29 | 0 | 5.09 |
| മലപ്പുറം | 40 | 38 | 119.74 | 36 | 117.23 | 34 | 74.45 | 30 | 0 | 10.15 |
| പാലക്കാട് | 27 | 27 | 61.11 | 21 | 50.47 | 20 | 49.63 | 13 | 0 | 16.12 |
| പത്തനംതിട്ട | 37 | 37 | 56.95 | 36 | 50.81 | 35 | 49.92 | 28 | 3 | 13.89 |
| തിരുവനന്തപുരം | 39 | 39 | 316.90 | 39 | 260.45 | 36 | 195.32 | 35 | 1 | 52.79 |
| തൃശ്ശൂർ | 46 | 43 | 232.58 | 36 | 160.36 | 33 | 126.64 | 27 | 0 | 11.51 |
| വയനാട് | 8 | 6 | 35.29 | 6 | 34.62 | 5 | 28.01 | 3 | 0 | 18.41 |
| ആകെ | 452 | 416 | 2213.06 | 383 | 1717.55 | 369 | 1359.95 | 301 | 15 | 240.68 |

# "Water Neutrality and Positivity": India's Sustainable Water Future

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**Introduction:**

Water stress and scarcity is truly a global issue and one that is already affecting millions of people all over the world, with every continent impacted in some way by the water crisis. The issue is a complex one and there are different sources of pressure affecting water availability, everything from population growth and increased urbanisation to climate change, extreme weather events, water mismanagement and ageing infrastructure. Water is a scarce commodity for many reasons, demand for water may be exceeding supply, water infrastructure may be inadequate, or institutions may be failing to balance everyone's needs. Water scarcity is an increasing problem everywhere, with poorer communities most badly affected. To build resilience against climate change and to serve a growing population, an integrated and inclusive approach must be taken to manage this finite resource.

Water scarcity is a relative concept. The amount of water that can be physically accessed varies as supply and demand changes. Water scarcity intensifies as demand increases and/or as water supply is affected by decreasing quantity or quality. Water is a finite resource in growing demand. As the population increases, and resource-intensive economic development continues, India's' water resources and infrastructure are failing to meet accelerating demand. More over Climate change is making water scarcity worse. The impacts of a changing climate are making water more unpredictable. Terrestrial water storage – the water held in soil, snow and ice – is diminishing. This results in increased water scarcity, which disrupts societal activity. Women and girl children are among the hardest hit in India. Poor and marginalized groups are on the frontline of any water scarcity crisis, impacting their ability to maintain good health, protect their families and earn a living. For many women and girls, water scarcity means more laborious, time-consuming water collection, putting them at increased risk of attack and often precluding them from education or work. Further, Lack of data means lack of integrated management. Many countries do not have well developed water monitoring systems, which prevents integrated water resource management that can balance the needs of communities and the wider economy, particularly in time of scarcity.

### What is Water Neutrality/Positivity?

One strategy that could prove highly effective is the concept of water neutrality/positivity. Going water neutral/positive means that the water footprint of any and all activities are reduced as far as is practicably possible, with the negative externalities of the remainder then offset.

In some instances, it will be possible to go completely water neutral, such as by using water recycling and producing zero wastage of water. In this case, the existing water footprint would be entirely negated. However, there are some activities where this would be impossible, such as in agriculture where water usage and consumption are essential. Under these circumstances, water usage cannot be brought to zero, but water neutrality can still be achieved by ensuring that the negative socioeconomic and environmental externalities are reduced as far as is possible, with any remaining impacts then fully compensated for by investing in sustainable water usage. For determining **water neutral/ positive roadmap** there is a requirement of an interface between water security challenges at the regional and local levels considering the variability of water availability both over time and space.

Water neutrality is a new concept in the world of water management in new developments, however it's a super important step and needs to be considered by developers. According to Therival et al., The total demand for water should be the same after a new development is built as it was before. Overall, the new demand for water should neutralise the community by creating exhibiting homes and buildings in the same area more water efficient. It invites interest and positive action, providing opportunity to change water footprint impact into action within communities and businesses.

Water neutrality concept, which talks about offsetting of impacts (reduction in water footprint) is to be addressed within the same hydrological unit where the impacts take place, i.e. water depletion or pollution in one river basin cannot be neutralised by water saving or pollution control in another basin, water security roadmap requires appropriate measures/strategies to be taken within the same hydrological unit (or watershed).


**Water Neutrality Hierarchy**

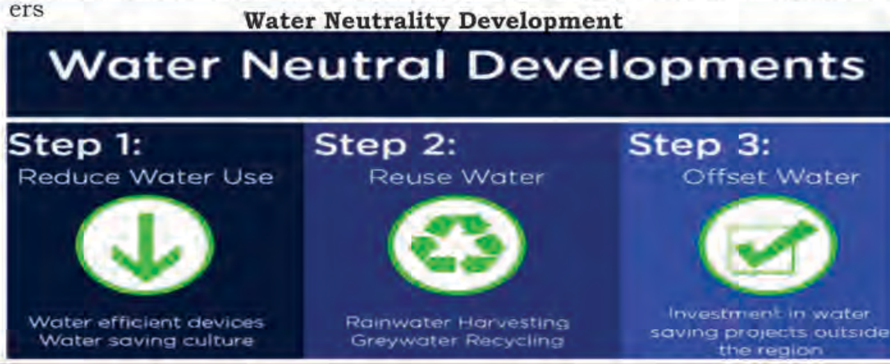
The above point is emphasised in the National Water Policy 2012, which states, planning, development and management of water resources need to be governed by common integrated perspective considering local, regional, State and National context, having an environmentally sound basis, keeping in view the human, social and economic needs. The Policy emphasizes on the need to consider basin/watershed as the unit of planning. All the elements of the water cycle, i.e., evapo-transpiration, precipitation, runoff, river, lakes, soil moisture, and ground water, water to sea, etc., are interdependent and the basic hydrological unit is the river basin, which should be considered as the basic hydrological unit for planning. (National Water Policy, 2012). The very recent Draft National Water Framework Bill 2016, further states, that 'each river basin, including associated aquifers, need to be considered as the basic hydrological unit for planning, development and management of water.

Water neutrality, in its essence, is about finding equilibrium between the total consumption of freshwater and the quantifiable water savings resulting from efficient strategies. It encompasses both direct and indirect water usage, fostering a holistic perspective on water management. To put it simply, water neutrality is achieved when an entity manages to save as much water through efficient practices as it uses in its core operations, ensuring a balanced water equation.

Water neutral / Positive is a pioneering concept that transcends the mere conservation of water resources, empowering entities such as corporations, communities, and individuals to become active stewards of sustainable water management and restoration.

This transformative approach involves the strategic implementation of innovative practices and cutting-edge technologies designed to minimize water consumption, enhance water quality, and bolster water availability. By embracing the Water neutral/ Positive philosophy, organizations and individuals alike can leave an indelible, beneficial impact on water ecosystems, ensuring that the volume of water conserved and restored surpasses the amount used or depleted. This proactive stance not only addresses the pressing challenges of water scarcity and degradation but also paves the way for a more resilient and sustainable future, where the responsible management of water resources becomes a shared priority for all stakeholders

**Water Neutrality Development**




Household level rooftop rain water harvesting system

## What Needs To be Done?

To drive adoption of water neutral/ positive collaboration and cooperation among various stakeholders is essential. In addition, water neutral/ positivity needs to be a priority for new residential and commercial developments. A master-planned community, for instance, or even a new set of apartments, can easily become water neutral/ Positive through a network of optimised consumption, optimised design that avoids water use, a robust educational offering to residents to ensure that behaviours are in synch with the technology available. A recycling system can then bring the equation closer to neutral through the use of recycled water for toilet flushing, laundry and soil irrigation, and a combination of water harvesting – rainwater, stormwater, treated water reuse as part of water circularity.

"**Being water neutral/ positive has to be a holistic approach**. It's about looking at where water comes from, how it's utilised, and the impact of taking it out of that particular source, treating it, and then putting it back. For instance, if you take water out of a river, you treat it, people drink it, you recycle and treat it, and it becomes irrigation for farms, what is the impact of that process on the environment and the economy? You have to consider it as a holistic approach.

Implementing technologies and processes to reduce direct and indirect water consumption through process optimization, circular production, and water recycling and reuse.

Offsetting the residual water footprint through projects that increase and improve the availability and quality of water in impacted basins through the construction of wetlands and algal farms, the treatment plants, reforestation, aquifer recharge, rainwater harvesting systems, among other innovations.

Investment in research and development to implement new technologies that optimize water use. Establishing partnerships with NGOs, local communities and other actors to advance integrated management of shared water resources. Promoting a culture of water sustainability among consumers through awareness programs on the responsible use of water. Establishing compensation incentives for the application of multiple barrier purification systems such as ultrafiltration, microfiltration, nanofiltration, reverse osmosis, ultraviolet radiation or their combination that sustainably purifies water and achieve Water Positive production goals.

## Water Neutrality Should be the Goal of All Communities:

Attaining water neutral/water positive status is a journey that calls for collective accountability and responsible actions. It is a process that will evolve with time, given increasing climate variability impacting resource availability and demand pressures continuing to rise. Safeguarding water and ensuring its availability in sufficient quantity and quality is therefore imperative. Manifestation of widening water demand-supply gaps are clearly visible with increasing water shortages, depleting groundwater tables and deteriorating resource quality. High spatial variability in rainfall and high inter-annual variability further exacerbates the prevalent water stress situation. Given the above scenario of rising resource challenge, it is important to adopt strategies that can enable progress to an improved water scenario. Hence, various level stakeholders have to increasingly play a pivotal role through to ensure water resources are managed **responsibly, sustainably, and equitably**. According to Water Action decade initiative 2018-2028, there will be a steep fall of around 40 per cent in freshwater availability by 2030, which alongside of rising population will push towards a global water crisis.

No matter what the current state of water use is in any given community, there should always be an eye turned toward ways to achieve water neutrality/positivity. Increasing concerns over the availability of water all around the world have made this an essential goal for any community that is concerned about the conservation of its water resources.

Water neutrality is possible to achieve through diligent efforts on the part of everyone in each community and through the support of the local government. This goal can be readily achieved through a multi-faceted effort within any community. Saving water is not enough. Reuse and recycling also need to be a part of any water neutrality scheme. Water neutrality is a critical aspect of any future reality where there are enough water resources for everyone around the world. This is no longer a question of preference, and everyone needs to work hard to be part of the solution which limits water waste all around the world. It encapsulates complex and interconnected challenges and highlights water's centrality for achieving a sense of **security, sustainability, development and human well-being, from the local to the international level.**

- ***Water conservation: for example, reducing water consumption before developing new sources of supply.***
- ***Integration of groundwater and surface water management and protection of water supplies from contamination.***
- ***Ensuring water quality.***
- ***Prioritization of source water protection (and planning) over land use needs.***
- ***Recognition and protection of Ecological services associated with water.***
- ***Protection of all values of water.***

Specifically, ensuring water security from a local perspective which define a sustainable access to water of sufficient quantity and quality for basic human needs and ecosystem Health. (Norman E. et al. 2010, WaterAid, 2012).

**POSITIVITY/NET POSITIVE WATER INITATIVE:**

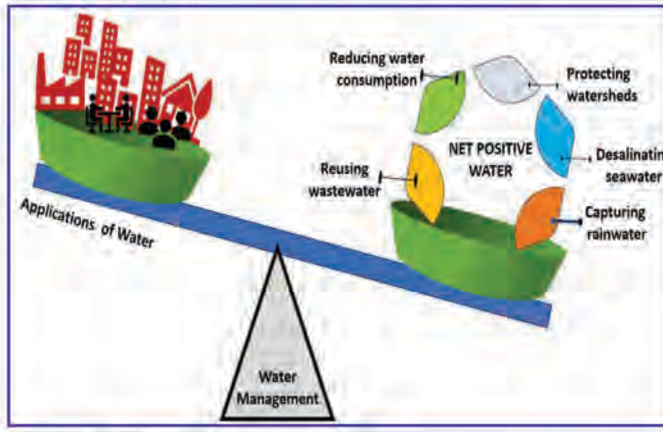
Positivity/ Net Positive Water initiative should be designed to help businesses/other institution, Municipal supplies and Agricultural activity go beyond water sustainability by actively contributing to the restoration and replenishment of water resources by adopting judicious water saving and conservation measures.

**Concepts and Steps to Achieving Net Water Positive:**

**The following are the steps towards achieving water**


**Perspective Steps towards achieving Net Water positivity**

**Net water Positive concept** in water resource management that refers generating more water than any organization, institutions and other entities uses over time. It contributes to replenishing local water resources and reducing the environmental impact. Net water positive is a crucial event to be practised due to continuously occurring water scarcity and climate change effects on water resources.




**Benefits of Net water Positive**

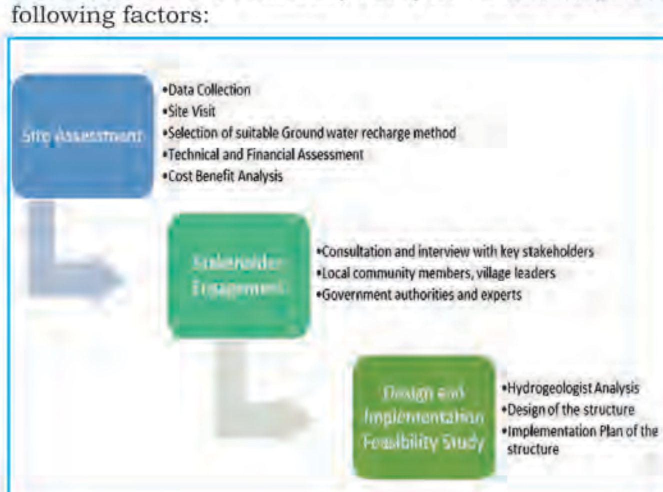
| | | | |
|---|---|---|---|
| **Reduces water usage and environmental impact** | **Contributes to local water resource sustainability** | **Mitigates risks of water scarcity and climate change** | **Enhances organization's commitment to environmental stewardship** |

Net Water Positive Study should always focus on the following:

- Analyses water cycle to identify excess water generation.
- Focuses on water usage in industries, Agricultural practices, domestic water and its judicious utilization by adopting various water saving and water conservation measures.
- Net water positive aims to return more water to the environment than used in a multifarious activity.

The ultimate Goal is to help businesses/ industries/ Agricultural activities/institutions/ municipal water supply sectors for domestic usage to become more environmentally friendly and sustainable. By reducing their water use, and increasing their recycling, reuse and "WATER CIRCULARITY" scenarios.

Net Water Positive Feasibility Analysis should adopt the following factors:



**A few of the Net water positive Approaches.......**


**Insights from NITI Aayog Report on Water Neutrality and Water Security:**

According to the NITI Aayog's insightful report, adhering to water neutrality standards has the potential to conserve a staggering **38.23 billion cubic meters of water over the next decade**. This projection underscores the far-reaching impact of this concept on water conservation efforts, contributing significantly to the conservation of a precious and finite resource.

**Integration with National Goals:**

The National Water Mission's Goal 4, which focuses on enhancing water use efficiency by 20%, strongly advocates for the promotion of water-neutral and water-positive technologies. This integration of water neutrality principles into national goals demonstrates the government's commitment to addressing water scarcity and promoting sustainable development.

**Holistic Consideration of Impact:**

The NITI Aayog's emphasis on evaluating water neutrality and positive impact assessments while considering resource availability and quality is crucial. This approach ensures that the pursuit of water neutrality doesn't inadvertently harm the overall ecosystem. By prioritizing sustainable water practices, any residual negative impacts can be mitigated, promoting a harmonious balance between industrial growth and environmental preservation.

This concept aims to save water, enhance its efficient utilization, and enable the validation of water neutrality claims by industries. The Aayog emphasizes that water neutrality/positive impact assessments should consider both resource availability and quality, ensuring any remaining impacts are offset through sustainable water practices.

**"SEVEN PRINCIPLES FOR WATER NEUTRALITY"**

**Principle I:** Water use efficiency through wastewater reuse, recycle and freshwater reduction.

**Principle 2:** Defining Assessment Unit: **(Establishing spatial context) (watershed basis)**

**Principle 3:** Neutralizing impacts in the same watershed (it is imperative to consider that water depletion or pollution in one watershed/ groundwater system of a watershed cannot be compensated or neutralized by water saving or pollution control in another watershed)

**Principle 4:** Source diversification: -

Source diversification (moving away from fresh water sources that are critical or stressed) is essential towards achieving neutrality. Alternate water sources such as use of treated wastewater, rainwater harvested, desalinated sea water, nature-based solutions, are few options that can be explored both for plant and supply chains.

**Principle 5: Mapping, Monitoring and Measuring (3M)**

Impact evaluations and offsetting against total water consumed would need to be monitored to ensure whether the neutrality targets are being met. This principle therefore stresses the need to achieve a measurable impact on availability, quality, and accessibility.

menu of strategies to enable a water neutral pathway needs to be built on **3M-7R approach as depicted below.**


**3M: 7R APPROACHES........**

**Principle 6: Defining Water Neutrality: Temporal context:**

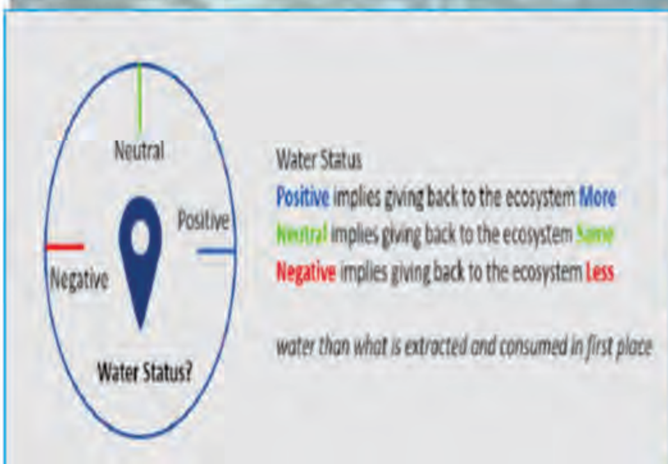
Defining water status (i.e., neutrality or positivity) along with spatial context, temporal parameters that are distributed both in space and time, must be considered. Developing an understanding especially with respect to the spatial/temporal dynamics of achieving neutrality are imperative so that it becomes a useful concept to apply operationally.

Also, climate extremes such as droughts need to be adequately addressed. So, water neutrality for a drought year would also cover efforts or preparedness that include choices such as:

- ***Reduction in relative scale of operation***
- ***Diversification of freshwater sources***
- ***Diversification in water critical supply chains***
- ***Increase in reuse, recycle, recovery mechanisms***
- ***Stop-gap arrangements e.g., tankers from areas not impacted by droughts.***
- ***Other adaptive measures in consideration with hydrological and watershed balances.***
- ***Focus on nature-based solutions.***

**Principle 7: Elements of Estimating Credits and debits**

Operational efficiency, operational sustainability, and supply-chain systems, all inclusive, form elements of estimating credits and debits towards defining water status (i.e water neutral, water positive, and water negative). Through water neutrality a system of accountability and responsibility for water footprint of the industry or other institutions are established such that there is a transparency of all the water usages of the system. In adherence to defined principle, for achieving measurable and a net positive impact on availability, quality and accessibility of water, the following needs to be considered.




**Water Status Description**

**Applicability of Water Neutrality:**

- Primary aim of water neutrality concept is to reduce demand for water (i.e., maximize **operational efficiency through 3M-7R approach).** While doing this it is important to note that,
- Water neutrality is not regarded as a replacement for existing regulatory tools.
- Analysis is undertaken using water (institutional, corporate or organizational) data for either the annual average or critical period.
- Analysis considers uncertainty associated with supply and demand data to assess how water neutrality activity is going to be effective at reducing demand.
- While assessing role of rainwater harvesting, possible effects of rainwater harvesting on local hydrology and hydrogeology should be assessed on a site-to-site or location basis. In areas where there is little or no hydrological impact then rainwater harvesting can contribute to reducing demand.
- Similarly, grey water, recycling systems or treated water reuse as part of water circularity can also contribute to reducing demand.
- Achieving a 100% level of water neutrality is an aspiration. There will be 'drivers' and 'constraints' that will define what level of neutrality (between 0% and 100%) is appropriate.
- Drivers include environmental factors, climate analysis, and cost-effectiveness.
- Constraints include the relative size of the operations, consumption rates and predicted consumption in case of new development/ expansion/ growth in operations.

**Supply Chain analysis for Strategic decisions in achieving water neutrality:**

**Water neutrality is a concept that aims to balance the amount of water used by an entity (such as an individual, organization, or community)** with the amount of water returned to the environment, ensuring no net loss of water resources. This can involve reducing water consumption, recycling wastewater, and replenishing water sources. Below is an explanation of water neutrality:


**Strategic decisions for water neutrality**

**Ensuring Operational Efficiency (Objective: Maximising Operational water Use Efficiency.)**

The key objective of **"ensuring Operational efficiency"** is to try and maximize operational water use efficiency levels such that the balance water utilization (compared to the total water consumption i.e., both direct and virtual) then defines the resource offset that needs to be undertaken at the plant's watershed level as well as supply chain water critical watersheds

A comprehensive water audit gives a detailed profile of the distribution system and water users, thereby facilitating easier and effective management of the resources with improved reliability. Moreover, it is a practice to ensure optimal utilization of water per unit production. Hence it is important to prepare benchmarking for each of the water using sectors for annual water auditing through certified auditors accredited by Government Agency.

water audit defines the process of accounting for water inflows and outflows as well as changes in water storage such as changes in the water levels in water storage tanks within a plant. This involves detailed analysis of water use at a given site for a certain duration and includes all sources of water intake, storages, and various uses in functional process units and operations of the plant. Audit acts as an important step in water management hierarchy for multifarious usages.

"Comprehensive water audit helps in correct diagnosis of the problems faced in order to suggest optimum solutions. It is also an effective tool for realistic understanding and assessment of the present performance level and efficiency of the service and the adaptability of the system for future expansion and rectification of faults during modernization."

One important step towards becoming a water neutral or positive is that the industry/institutions must mandatorily carry out the **water audit** at regular intervals by a certified agency so as to obtain a water balance, inventorying all the water usages by measuring flow of water from the site of water withdrawal or treatment, through the distribution system, and into areas where it is used and finally discharged. Going forward, benchmarking for each of the water using sectors needs to be prepared for annual water auditing through certified auditors accredited by Government Agency.

**Water Governance: Measuring Water and Mapping Risks:**

Effective water governance ensures sustainable management and equitable distribution of water resources, balancing social, economic, and environmental needs. Advanced methods like remote sensing, satellite imagery, and IoT sensors provide precise data on water availability, usage, and quality, aiding in informed decision-making. It is also advocated to go for comprehensive models assess risks related to water scarcity, pollution, and climate change impacts, helping stakeholders prioritize interventions and allocate resources efficiently. There is an absolute need for robust policies and regulations, based on accurate data and risk assessments, are essential for managing water resources and mitigating conflicts among users. The needs to be an assured stakeholder Involvement with local communities, governments, and private sectors ensures inclusive governance, with transparent decision-making processes and shared responsibilities.

**Technological innovations, such as smart irrigation systems and wastewater recycling in industries, reduction in NRW (Non-revenue water by 20% towards Drinking water supply) etc, contribute to sustainable water management and reduce vulnerability to risks**. The Ongoing research and adaptive governance frameworks are crucial to tackle emerging water risks and ensure the resilience of water systems in a changing global landscape.

*Judicious usage and Saving Water Ensuring Water Neutrality and Positivity*

**Role of Monitoring and Evaluation:**

In the process of setting targets for water neutrality/ positivity, monitoring and evaluation activities are to be taken in to consideration for how effective the new development is in meeting the targets, should be considered. Demand and demand offsetting will need to be monitored to determine whether neutrality is being met. Monitored data would need to be reviewed (in quantifiable terms) to determine whether progress towards neutrality or positivity is in line with all the claims being made. This performance assessment should be taken up after a gap of 3 years to trigger further actions, if required in due course of time.

**Conclusion and the Way Forward:**

Water has to be treated as a scarce resource. Integrated water resources management (IWRM) provides a broad framework for governments to align water use patterns with the needs and demands of different users, including the environmental requirements. Good quality data on water resources; water-saving, green and hybrid technologies, particularly in industry, institutional, domestic and agriculture; and awareness campaigns to reduce the use of water in households and encourage sustainable diets and consumption. Groundwater is also a part of the solution. Exploring, protecting and sustainably using groundwater will be central to surviving and adapting to climate change and meeting the needs of a growing population.

Each and Every region has its own water-related issues to deal with, as well, which means there is no one size fits all approach to solving this particular climate emergency... and collaborative efforts will be required in order to address the situation effectively, with governments, non-government organisations, businesses, non-profits and individuals alike all having to come together to reduce their own water footprints now and well into the future.

Water neutrality/positivity is a journey to enable appropriation of practices and measures for an improved water scenario considering both water resource availability and water quality. It proceeds towards achieving the water positive status after augmentation through various means of sustainable water use and water conservation measures such as rainwater harvesting and reuse/ recycling the treated water of suitable quality in the processes and subsequent storages.

It should be assured that Water neutrality analysis needs to be revisited at regular (e.g. 2–3-year intervals) with reassessment of uncertainty. Further, the approach to accounting this uncertainty also needs to be revisited periodically. This may result in modifications to water neutrality and positivity strategies which will then need to be reviewed at the next review point. Hence, the approach on water neutrality/ positivity should be a continuity process to monitor and evaluate time to time ensuring water use efficiency and water circularity.

***"The Best way to Predict the future is to create it. Hence, start by saving water Today. Water is always the driving force of nature – "Conserve water, conserve life".***

# ‘അൻബോഡ് രാജമാണിക്യം’ പ്രകാശന ചടങ്ങ്

‘അൻബോഡ് രാജമാണിക്യം’ പ്രകാശനം ചെയ്തു. അമൃത് മിഷൻ ഡയറക്ടറായിരുന്ന രാജമാണിക്യം ഐ.എ.എസ്. രചിച്ച അൻബോഡ് രാജമാണിക്യം എന്ന പുസ്തകം പത്മശ്രീ മമ്മൂട്ടി, പ്രമുഖവ്യവസായി യൂസഫലി, മുൻ ഡി.ജി.പി. ലോക്നാഥ് ബെഹ്റ എന്നിവരുടെ സാന്നിദ്ധ്യത്തിൽ പ്രകാശനം ചെയ്തു. കുട്ടിക്കാലം മുതൽ താൻ കടന്നുവന്ന വഴികളിലൂടെയുള്ള ഓർമ്മക്കുറിപ്പുകളാണ് പുസ്തകം. പ്രതിസന്ധികളിലൂടെ കടന്നുപോകുന്നവർക്കും വിദ്യാർത്ഥികൾക്കും വളരെയധികം പ്രചോദനമാകുന്ന പുസ്തകമാണിത്. ഒലിവ് പബ്ലിക്കേഷനാണ് പുസ്തകത്തിന്റെ പ്രസാധകർ.


# അമൃത് പദ്ധതി സൂചിക (31.07.2024 പ്രകാരം)

### കേരളം
2357.69 കോടി രൂപയുടെ 1111 പദ്ധതികൾ
2386.93 കോടി രൂപയുടെ 1111 പദ്ധതികൾക്ക് ഭരണാനുമതി
2341.62 കോടി രൂപയുടെ 1111 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
2330.24 കോടി രൂപയുടെ 1109 പദ്ധതികൾ ടെന്റർ ചെയ്തു
2276.88 കോടി രൂപയുടെ 1101 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
965 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 1915.15 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

### തിരുവനന്തപുരം
357.50 കോടി രൂപയുടെ 317 പദ്ധതികൾ
415.07 കോടി രൂപയുടെ 317 പദ്ധതികൾക്ക് ഭരണാനുമതി
391.07 കോടി രൂപയുടെ 317 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
388.23 കോടി രൂപയുടെ 316 പദ്ധതികൾ ടെന്റർ ചെയ്തു
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264 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 304.26 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

### കൊല്ലം
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183.26 കോടി രൂപയുടെ 56 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
49 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 122.20 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

### ആലപ്പുഴ
222.70 കോടി രൂപയുടെ 212 പദ്ധതികൾ
242.20 കോടി രൂപയുടെ 212 പദ്ധതികൾക്ക് ഭരണാനുമതി
223.62 കോടി രൂപയുടെ 212 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
223.24 കോടി രൂപയുടെ 211 പദ്ധതികൾ ടെന്റർ ചെയ്തു
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194പദ്ധതികൾ പൂർത്തീകരിച്ചു. 201.45 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

### കൊച്ചി
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94 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 196.37 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

### തൃശ്ശൂർ
269.93 കോടി രൂപയുടെ 136 പദ്ധതികൾ
283.44 കോടി രൂപയുടെ 136 പദ്ധതികൾക്ക് ഭരണാനുമതി
283.44 കോടി രൂപയുടെ 136 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
283.44 കോടി രൂപയുടെ 136 പദ്ധതികൾ ടെന്റർ ചെയ്തു
283.44 കോടി രൂപയുടെ 136 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
121പദ്ധതികൾ പൂർത്തീകരിച്ചു. 249.43 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

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203.10 കോടി രൂപയുടെ 33 പദ്ധതികൾ
213.78 കോടി രൂപയുടെ 33 പദ്ധതികൾക്ക് ഭരണാനുമതി
213.78 കോടി രൂപയുടെ 33 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
213.78 കോടി രൂപയുടെ 33 പദ്ധതികൾ ടെന്റർ ചെയ്തു
213.78 കോടി രൂപയുടെ 33 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
27 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 183.85 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

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225.94 കോടി രൂപയുടെ 147 പദ്ധതികൾക്ക് ഭരണാനുമതി
227.22 കോടി രൂപയുടെ 147 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
225.33 കോടി രൂപയുടെ 147 പദ്ധതികൾ ടെന്റർ ചെയ്തു
215.57 കോടി രൂപയുടെ 147 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
134 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 181.90 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

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276.23 കോടി രൂപയുടെ 57 പദ്ധതികൾക്ക് ഭരണാനുമതി
276.23 കോടി രൂപയുടെ 57 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
276.23 കോടി രൂപയുടെ 57 പദ്ധതികൾ ടെന്റർ ചെയ്തു
262.69 കോടി രൂപയുടെ 55 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
47 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 251.04 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

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244.67 കോടി രൂപയുടെ 40 പദ്ധതികൾക്ക് ഭരണാനുമതി
243.83 കോടി രൂപയുടെ 40 പദ്ധതികൾക്ക് സാങ്കേതികാനുമതി
237.52 കോടി രൂപയുടെ 40 പദ്ധതികൾ ടെന്റർ ചെയ്തു
236.83 കോടി രൂപയുടെ 40 പദ്ധതികൾ വർക്ക് അവാർഡ് ചെയ്തു
35 പദ്ധതികൾ പൂർത്തീകരിച്ചു. 224.66 കോടി രൂപ നാളിതുവരെ ചെലവഴിച്ചു

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